Analytical and Bioanalytical Chemistry 2011 vol.400 N4, pages 1009-1013

Microscreening toxicity system based on living magnetic yeast and gradient chips

García-Alonso J., Fakhrullin R., Paunov V., Shen Z., Hardege J., Pamme N., Haswell S., Greenway G.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

There is an increasing demand for easy and cost-effective methods to screen the toxicological impact of the growing number of chemical mixtures being generated by industry. Such a screening method has been developed using viable, genetically modified green fluorescent protein (GFP) reporter yeast that was magnetically functionalised and held within a microfluidic device. The GFP reporter yeast was used to detect genotoxicity by monitoring the exposure of the cells to a well-known genotoxic chemical (methyl methane sulfonate, MMS). The cells were magnetised using biocompatible positively charged PAH-stabilised magnetic nanoparticles with diameters around 15 nm. Gradient mixing was utilised to simultaneously expose yeast to a range of concentrations of toxins, and the effective fluorescence emitted from the produced GFP was measured. The magnetically enhanced retention of the yeast cells, with their facile subsequent removal and reloading, allowed for very convenient and rapid toxicity screening of a wide range of chemicals. This is the first report showing magnetic yeast within microfluidic devices in a simple bioassay, with potential applications to other types of fluorescent reporter yeast in toxicological and biomedical research. The microfluidic chip offers a simple and low-cost screening test that can be automated to allow multiple uses (adapted to different cell types) of the device on a wide range of chemicals and concentrations. © 2010 Springer-Verlag.

http://dx.doi.org/10.1007/s00216-010-4241-3

Keywords

GFP reporter yeast, Magnetic retention, Microfluidic devices, Toxicity screening